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ABSTRACT

Several intermediate performance objectives and corresponding criterion measures are listed for each of 16 terminal objectives for an intermediate appliance repair course. The materials were developed for a 36-week course (3 hours daily) covering the areas of refrigeration, maintenance, repair, and troubleshooting of refrigerators and air conditioning. Titles of the 16 terminal objectives sections are Copper Tubing, Basic Refrigeration, Refrigeration, Refrigeration Cycles, Refrigeration Components, Refrigerants, Temperature Controls, Automatic Defrost, Evacuating and Charging, Assembly, Troubleshooting (Electrical Refrigerator), Room Air Conditioning, Troubleshooting (Room Air Conditioners), Renewal Parts, Inventory Control, Shop Management, and S.I.E. Program. (This manual and 54 others were developed for various secondary level vocational courses using the System Approach for Education (SAFE) guidelines.) (HD)

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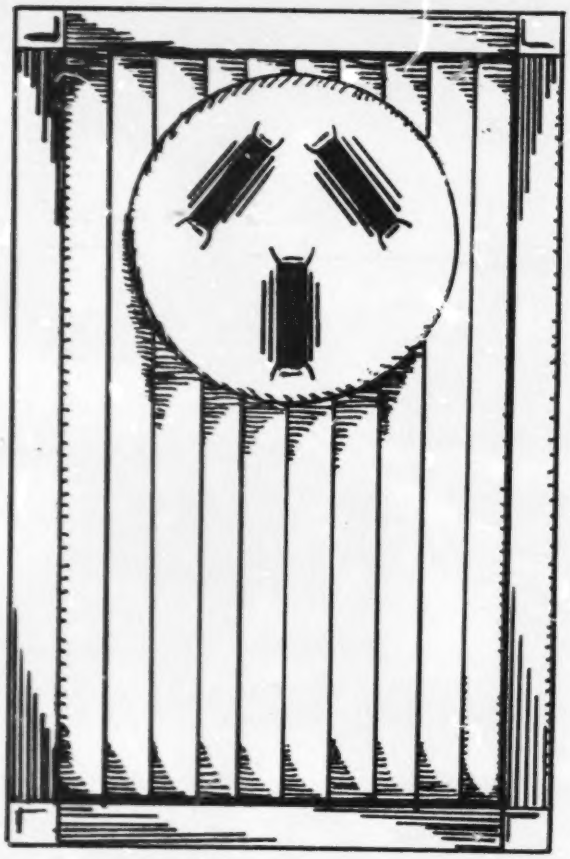
appliance services

INTERMEDIATE COURSE



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October, 1972

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APPLIANCE REPAIR - INTERMEDIATE

ACCREDITATION NO. 9025

LENGTH OF COURSE: 36 WEEKS

TIME BLOCK: 3 HOURS DAILY

COURSE DESCRIPTION

This course includes Refrigeration, Maintenance, Repair and Troubleshooting of Refrigerators and Air Conditioners.

9025 - APPLIANCE REPAIR - INTERMEDIATE

Syllabus Of Terminal Performance Objectives

26.0 Copper Tubing
27.0 Basic Refrigeration
28.0 Refrigeration Cycles
29.0 Refrigeration Components
30.0 Refrigerants
31.0 Temperature Controls
32.0 Automatic Defrost
33.0 Evacuating and Charging
34.0 Assembly
35.0 Troubleshooting (Electrical Refrigerator)
36.0 Room Air Conditioners
37.0 Troubleshooting (Room Air Conditioners)
38.0 Renewal Parts
39.0 Inventory Control
40.0 Shop Management
41.0 S.I.E. Program

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 26.0

COPPER TUBING

The student will with 80% proficiency describe the uses of copper tubing in appliance service and demonstrate his ability to make joints that withstand leak tests at 100# P.S.I.

No.	Intermediate Performance Objectives	No.	Criterion Measures
26.1	The student will with 80% proficiency describe the proper use, proper tools and demonstrate his ability to make a flare fitting.	26.1	Describe the proper use, proper tools and make a flare fitting using ½" tubing.
26.2	The student will with 80% proficiency swage and solder 3/8" copper tubing with 95/5 solder.	26.2	Swage and solder with 95/5 solder 3/8" copper tubing to withstand leak tests at 100# P.S.I.
26.3	The student will with 80% proficiency swage and solder ½" copper tubing using silver solder.	26.3	Swage and silver solder ½" copper tubing to withstand 1 leak test at 100# P.S.I.
26.4	The student will with 80% proficiency swage and solder a piece of ½" copper and 3/8" steel tubing using silver solder.	26.4	Swage and silver solder a piece of ½" copper and 3/8" steel tubing to withstand a leak test at 100# P.S.I.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 27.0

BASIC REFRIGERATION

The student will with 90% accuracy draw a basic refrigeration system, name its parts, and describe the refrigerant state in each part.

No.	Intermediate Performance Objectives	No.	Criterion Measures
27.1	The student will with 90% accuracy explain the application of heat and heat energy in refrigeration.	27.1	Explain the application of heat and heat energy in refrigeration.
27.2	The student will with 90% accuracy describe the effect of heat energy on pressure and volume.	27.2	Explain the effect of heat energy on pressure and volume.
27.3	The student will with 90% accuracy define sensible heat and its relationship to heat measurement.	27.3	Define sensible heat and it's relationship to heat measuremert.
27.4	The student will with 90% accuracy define latent heat and its relationship to a change in matter.	27.4	Define latent heat and it's relationship to a change in matter.
27.5	The student will with 90% accuracy explain the concept of heat transfer and name the three means of transfer.	27.5	Explain the concept of heat transfer and name three means of transferring heat.
27.6	The student will with 90% accuracy explain the function of insulation and the effects of moisture on it.	27.6	Explain the function of insulation and what effect moisture will have on it.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 28.0 REFRIGERATION CYCLES

The student will with 90% accuracy describe the refrigeration cycle, give their classification, and name the two types of refrigeration.

No.	Intermediate Performance Objectives	No.	Criterion Measures
28.1	The student will with 90% accuracy describe the evaporation and the absorption refrigeration cycle.	28.1	Describe the evaporation and absorption refrigeration cycle.
28.2	The student will with 90% accuracy name the importance and types of temperature scales used in refrigeration.	28.2	Describe the types and the importance of types of temperature scales used in refrigeration.
28.3	The student will with 90% accuracy describe the function and techniques of changing fahrenheit degrees to centigrade degrees.	28.3	Describe the function and techniques of changing fahrenheit degrees to centigrade degrees.
28.4	With 90% accuracy name 4 types of temperature indicators.	28.4	Name 4 types of temperature indicators.
28.5	The student will name 2 of three temperature and recording devices.	28.5	Name 2 temperature controls and recording devices.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 29.0 REFRIGERATION COMPONENTS

The student will with 90% accuracy name the 5 major components of the refrigeration system and explain the function of each.

No.	Intermediate Performance Objectives	No.	Criterion Measures
29.1	The student will with 90% accuracy name the types of compressors and describe their operation.	29.1	Name the types of compressors and describe their operation.
29.2	The student will with 90% accuracy name the types of condensors and their function in the refrigeration system.	29.2	Name the types of condensors and describe their function in the refrigeration system.
29.3	The student will name 4 of 6 metering devices used in refrigeration.	29.3	Name 4 of the 6 metering devices used in refrigeration.
29.4	The student will describe the proper application of 3 of the 4 metering devices named.	29.4	Describe the proper application of 3 of the 4 metering devices named.
29.5	The student will name 2 of 3 types of evaporators used in household refrigerators.	29.5	Name 2 types of evaporators common to household refrigeration.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 30.0

REFRIGERANTS

The student will with 90% accuracy name the 3 common refrigerants, the saturation temperature of them and the safety precautions needed to handle them.

No.	Intermediate Performance Objectives	No.	Criterion Measures
30.1	The student will with 90% accuracy name the refrigerant commonly used in household refrigeration and give it's boiling point.	30.1	Identify and give the boiling point of the most common household refrigerator refrigerant.
30.2	The student will with 100% identify an F-22 cylinder, give its boiling point and describe its application.	30.2	Identify an F-22 cylinder, give it's boiling point, and describe its application.
30.3	The student will with 100% accuracy identify a R-502 cylinder, give it's boiling point and describe its application.	30.3	Identify an R-502 cylinder, give it's boiling point and describe its application.
30.4	The student will name 4 of 5 main safety precautions to be observed when working with refrigerants.	30.4	Name 4 of 5 main safety precautions to be observed when working with refrigerants.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 31.0

TEMPERATURE CONTROLS

The student will with 90% accuracy describe the two major types of temperature controls and demonstrate his ability to adjust them both.

No.	Intermediate Performance Objectives	No.	Criterion Measures
31.1	The student will with 90% accuracy describe the operation of a temperature control.	31.1	Describe the operation of a temperature control.
31.2	The student will with 90% accuracy describe the operation of a pressure control.	31.2	Describe the operation of a pressure control.
31.3	The student will with 90% accuracy adjust the cut-in, cut-out and differential of a temperature control.	31.3	Adjust the cut-in, cut-out and differential screw on a temperature control.
31.4	The student will with 90% accuracy adjust the cut-in, cut-out and differential on a pressure control.	31.4	Adjust the cut-in, cut-out and differential on a pressure control.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 32.0 AUTOMATIC DEFROST

The student will with 90% accuracy describe the function of reverse cycle defrost versus heater defrosting, and means of controlling defrost cycles.

No.	Intermediate Performance Objectives	No.	Criterion Measures
32.1	The student will with 90% accuracy describe reverse cycle defrosting.	32.1	Describe reverse cycle defrosting.
32.2	The student will with 90% accuracy describe the defrost cycle using heaters.	32.2	Describe the defrost cycle using heaters.
32.3	The student will name 2 of 3 majors means of controlling defrost cycles and explain the operation of each.	32.2	Name 2 major means of controlling the defrost cycle and explain the operation of each.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 33.0

EVACUATING & CHARGING

The student will with 100% accuracy install gauges, evacuate system and recharge system.

No.	Intermediate Performance Objectives	No.	Criterion Measures
33.1	The student will with 100% accuracy install low and high side gauges.	33.1	Install low and high side gauges.
33.2	The student will with 100% accuracy install a vacuum pump and pump system down to 26.5 inches of mercury.	33.2	Install vacuum pump and pump system down to 26.5 inches of mercury.
33.3	The student will with 100% accuracy charge the system with 14 oz. F-12 using a charging station.	33.3	Charge system with 14 oz. F-12 using the charging station.
33.4	The student will with 100% accuracy charge the system with F-12 using temperature - pressure relation method.	33.4	Charge the system with F-12 using the temperature pressure relation method.
33.5	The student will with 100% accuracy test the system for leaks using a halide leak detector.	33.5	Using a Halide leak detector test the system for leaks.
33.6	With 100% accuracy test the system for leaks using an electronic leak detector.	33.6	Using an electronic leak detector test the system for leaks.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 34.0 ASSEMBLY

Given the necessary components the student will assemble by means of silver solder a complete refrigerator system that will maintain 10° F in the evaporator.

No.	Intermediate Performance Objectives	No.	Criterion Measures
34.1	Given the necessary components the student will silver solder all joints in the heat exchanger to withstand 100# P.S.I. leak test.	34.1	Silver solder all heat exchanger joints to withstand a leak test at 100# P.S.I.
34.2	Given a vacuum pump and manifold the student will pump down system to 26.5 inches mercury.	34.2	Install manifold and vacuum pump and pump system down to 26.5 inches mercury.
34.3	Given a charging station and cylinder of F-12 the student will charge system to operate at 14.6 lb. back pressure.	34.3	Charge system with F-12 to operate at 14.6 lb. back pressure.
34.4	Given a leak detector the student will leak test the system with 100% accuracy.	34.4	Leak test the system.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 35.0

TROUBLESHOOTING (ELECTRIC REFRIGERATOR)

The student will with 100% accuracy diagnose troubles in the electrical, mechanical, and refrigeration system.

No.	Intermediate Performance Objectives	No.	Criterion Measures
35.1	The student will with 100% accuracy identify and diagnose electrical problems identified by the following customer complaints: 1. Won't run 2. Runs won't cool 3. Defrosting	35.1	Criteria contained in objective.
35.2	The student will with 100% accuracy identify and diagrose problem, identified by the following refrigeration complaints: 1. Won't cool 2. Has odor 3. Cycles on overload	35.2	Criteria contained in objective.
35.3	The student will with 100% accuracy identify and diagnose mechanical problems identified by the following customer complaints: 1. Noisy 2. Sweating 3. Door won't close	35.3	Criteria contained in objective.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 36.0

ROOM AIR CONDITIONERS

The student will with 90% accuracy uncrate and install a room air conditioner in three common type windows.

No.	Intermediate Performance Objectives	No.	Criterion Measures
36.1	The student will with 90% accuracy install a room air conditioner in a double hung window.	36.1	Install a room air conditioner in a a double hung window.
36.2	The student will with 90% accuracy install a room air conditioner in a jalousie window.	36.2	Install a room air conditioner in a jalousie window.
36.3	The student will with 90% accuracy install a room air conditioner in an awning window.	36.3	Install a room air conditioner in an awning window.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 37.0

TROUBLESHOOTING (ROOM AIR CONDITIONERS)

The student will with 100% accuracy diagnose troubles in the electrical, mechanical and refrigeration systems of a room air conditioner.

No.	Intermediate Performance Objectives	No.	Criterion Measures
37.1	The student will with 100% accuracy identify and diagnose problems in the electrical circuit as identified by the following customer complaints: 1. Unit won't run. 2. Fan won't run. 3. Unit smoking.	37.1	Criteria contained in objective.
37.2	The student will with 100% accuracy identify and diagnose mechanical problems as identified by the following customer complaints. 1. Leaking water outside. 2. Sweating on cabinet. 3. Leaking water inside.	37.2	Criteria contained in objective.
37.3	The student will with 100% accuracy identify and diagnose refrigeration problems as identified by the following customer complaints: 1. Not cooling 2. Icing up 3. Blowing smoke	37.3	Criteria contained in objective.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 38.0

RENEWAL PARTS

The student will with 90% accuracy, using the parts catalog, identify correct part numbers on selected appliances.

No.	Intermediate Performance Objectives	No.	Criterion Measures
38.1	The student will select the proper part number for 4 of 5 parts used in the drive train of an automatic washer.	38.1	Select 4 of 5 part numbers used in the drive train of an automatic washer.
38.2	The student will select the proper part number of 2 of the 3 thermostats used on an electric dryer.	38.2	Select 2 of 3 part numbers of thermostats used on an electric dryer.
38.3	The student will with 100% accuracy select the proper part numbers of all electric parts on an electric water heater.	38.3	Select all electric part numbers on an electric water heater.
38.4	The student will with 100% accuracy identify the proper part number for a compressor on an electric refrigerator.	38.4	Identify the part number of a compressor on an electric refrigerator.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 39.0

INVENTORY CONTROL

The student will with 90% accuracy write up an initial parts order for a 2 man service shop and set up a Kardex system for inventory control.

No.	Intermediate Performance Objectives	No.	Criterion Measures
39.1	The student will with 90% accuracy write up an initial parts order for a 2 man service shop to include only functional parts.	39.1	Write up an initial parts order for a 2 man shop, include only functional parts.
39.2	The student will with 90% accuracy draw up a sample inventory control card.	39.2	Draw a sample inventory control card.

ACCREDITATION NUMBER 9023

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 40.0 SHOP MANAGEMENT

The student will with 90% accuracy identify management positions, draw up a yearly budget, and an organization chart for a 30 man shop.

No.	Intermediate Performance Objectives	No.	Criterion Measures
40.1	With 90% accuracy identify all management positions in a 30 man service shop.	40.1	Identify all management positions in a 30 man service shop.
40.2	With 90% accuracy write up a yearly operating budget for a 30 man service shop.	40.2	Write up a yearly operating budget for a 30 man shop.
40.3	With 90% accuracy draw up an organization chart for a 30 man service shop.	40.3	Draw up an organization chart for a 30 man service shop.

ACCREDITATION NUMBER 9025

COURSE TITLE: APPLIANCE REPAIR (INTERMEDIATE)

TERMINAL PERFORMANCE OBJECTIVE NO. 41.0

S.I.E. PROGRAM

Upon demonstrating 75% proficiency in the first and second year of training the student shall be selected for participation in the School Industry Program for Appliance Service.

No.	Intermediate Performance Objectives	No.	Criterion Measures
		41.0	To enter the S.I.E. program the student shall be recommended by his instructor upon the students completion of the Basic and Intermediate course objectives
41.1	The learner will achieve 80% as stated in the training agreements for the School Industry Education Program.	41.1	Employer and S.I.E. Coordinators evaluation as per training agreement.